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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/521,942	01/21/2005	Takeshi Hikawa	DK-US055008	3925
22919 7590 09/13/2007 GLOBAL IP COUNSELORS, LLP 1233 20TH STREET, NW, SUITE 700 WASHINGTON, DC 20036-2680			EXAMINER BARBEE, MANUEL L	
			ART UNIT 2857	PAPER NUMBER
			MAIL DATE 09/13/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/521,942

Applicant(s)

HIKAWA ET AL.

Examiner

Manuel L. Barbee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13-21 and 23-35 is/are rejected.
- 7) ☒ Claim(s) 11, 12, 22 and 36-38 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 1/21/05: 10/12/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities:

On page 39, line 9, before "11", insert --Figure--.

Appropriate correction is required.

### ***Claim Objections***

2. Claim 36 is objected to because of the following informalities:

On line five of the claim, delete "PMSM", and insert --permanent magnet synchronous motor--.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 6, 7 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 5,754,450 to Solomon et al. (Solomon).

With regard to detecting a current or a voltage of a motor and predicting an internal condition based on the detection values, as shown in claims 1 and 6, Solomon teaches sensing current and determining a condition of compressor (col. 6, lines 13-54; col. 8, lines 35-67; Fig. 3). With regard to a refrigerant circuit with a compressor and a

motor, as shown in claim 6, Solomon teaches a motor for a compressor in a refrigeration device (col. 1, lines 11-21).

With regard to identifying a parameter of a motor model and deriving an internal condition based on the parameter, as shown in claims 2 and 7, Solomon teaches measuring current and determining a condition of the compressor based on the current (col. 8, lines 35-68).

With regard to a refrigerant system model and predicting an operating condition of the refrigerant circuit based on the information of the internal condition of the compressor, as shown in claim 33, Solomon teaches using the current to determine a condition of the compressor using thresholds which correspond to a model of the refrigeration system (col. 8, line 57 - col. 9, line 20).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent No. 5,512,883 to Lane, Jr. (Lane).

Solomon teaches all the limitations of claim 1 upon which claim 3 depends. Solomon does not teach predicting shaft abnormalities or poor lubrication, as shown in claim 3. Lane teaches measuring the current of a motor in a compressor to determine inadequate lubrication (col. 12, line 55 - col. 13, line 9). It would have been obvious to

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one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include determining inadequate lubrication, as taught by Lane, because then excessive wear from inadequate lubrication would have been avoided.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent No. 6,283,631 to Gousset et al. (Gousset).

Solomon teaches all the limitations of claim 1 upon which claim 4 depends. Solomon does not teach predicting motor temperature, as shown in claim 4. Gousset teaches using current to modeling the temperature of a motor using the output of current sensors placed on motor power supply phases (Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include determining motor temperature, as taught by Gousset, because then the motor would have been protected from prolonged overload (col. 1, lines 10-18).

8. Claims 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent No. 5,712,551 to Lee (Lee).

Solomon teaches all the limitations of claim 1 upon which claim 5 depends and claim 6 upon which claim 8 depends. Solomon does not teach a brushless DC motor, as shown in claims 5 and 8. Lee teaches a brushless DC motor (Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include fault detection for a

brushless DC motor, because then the motor would have been protected against adverse conditions (col. 1, lines 25-36).

9. Claims 9 and 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent No. 4,616,179 to Braun (Braun).

Solomon teaches all the limitations of claim 6 upon which claims 9 and 23 depend. Further, with regard to outputting information, as shown in claim 23, Solomon teaches outputting the determination (Fig. 4, step 530; col. 10, lines 42-45). Solomon does not teach identifying motor driving torque, as shown in claim 9. Braun teaches measuring torque of a motor (Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include measuring torque, as taught by Braun, because then mechanical load on the motor would have been measured and mechanical overload could have been avoided.

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent No. 4,596, 123 to Cooperman (Cooperman).

Solomon teaches all the limitations of claim 6 upon which claim 10 depends. Solomon does not teach predicting the high or low refrigerant pressure, as shown in claim 10. Cooperman teaches measuring suction pressure using current sensors (col. 19, lines 10-28). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include measuring suction pressure, as taught by Cooperman, because then suction pressure could have been maintained (Cooperman, col. 19, lines 19-28).

11. Claims 13 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of US Patent Application Publication 2002/0170305 to Nakajima (Nakajima).

Solomon teaches all the limitations of claim 6 upon which claims 13 and 18-20 depend. Solomon does not teach predicting an impact load, as shown in claim 13, or predicting poor lubrication or liquid compression based on the current, as shown in claims 18 and 19, or detecting refrigerant state and predicting the poor lubrication or liquid compression by making a comparison between stationary current and the detection current, as shown in claim 20.

Nakajima teaches predicting liquid compression, which also corresponds to an impact load, based on detecting a current and comparing it with a current threshold, which corresponds to the stationary current (pars. 26-31). Nakajima teaches sensing a temperature in the refrigerant system (par. 24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include detecting a temperature and predicting liquid compression, as taught by Nakajima, because then liquid compression would have been avoided (Nakajima, par. 5).

12. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Nakajima as applied to claim 13 above, and further in view of US Patent Application Publication 2003/0001536 to Kitajima (Kitajima).

Solomon and Nakajima teach all the limitations of claim 13 upon which claims 14-17 depend. Further, with regard to setting a reference value in accordance with the

refrigerant pressure, as shown in claims 16 and 17, Nakajima teaches setting the reference current based on pressure (par. 26). Solomon and Nakajima do not teach using the amount of distortion in the sign wave of the higher harmonic, as shown in claims 14-16. Kitajima teaches monitoring distortion in the higher harmonic of a current for a motor (pars. 12-15, 56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection combination, as taught by Solomon and Nakajima, to include monitoring distortion in the higher harmonic, as taught by Kitajima, because then motor efficiency would have been improved (Kitajima, par. 9).

13. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Braun as applied to claim 9 above, and further in view of Lane.

Solomon and Braun teach all the limitations of claim 9 upon which claim 21 depends. Solomon and Braun do not teach determining the poor lubrication or liquid compression based on motor driving torque. Lane teaches determining inadequate lubrication based on the current (col. 12, line 55 - col. 13, line 9). Since the motor driving current is directly related to the motor driving torque, the motor driving torque can also be related to the lubrication. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection combination, as taught by Solomon, to include determining inadequate lubrication, as taught by Lane and Braun, because then excessive wear from inadequate lubrication would have been avoided.



14. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Braun as applied to claim 9 above, and further in view of Japanese patent publication JP 2002-183966 to Toshiyuki et al. (Toshiyuki).

Solomon and Braun teach all the limitations of claim 9 upon which claims 24-26 depend. Solomon and Braun do not teach a protection component that control an inverter to protect the compressor and in preference to operation control of the refrigerant circuit. Toshiyuki teaches protecting a compressor by controlling an inverter for a motor in the compressor system to prevent excessive current and to control liquid compression conditions of the compressor (pars. 15-21, 50-52). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection combination, as taught by Solomon and Braun, to include protecting a compressor, as taught by Toshiyuki, because then the compressor will not need to be stopped because of excessive current (Toshiyuki, pars. 6 and 7).

15. Claims 24 and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Braun as applied to claim 9 above, and further in view of US Patent No. 5,056,032 to Swanson.

Solomon and Braun teach all the limitations of claim 9 upon which claims 24 and 27-32 depend. Solomon and Braun do not teach a protection component as shown in claim 24 or a switching component for switching from the protective operation to a steady operation based on the internal condition of the compressor, as shown in claims 24 and 27, or altering the control content or control parameter of the refrigerant circuit, as shown in claim 32. Swanson teaches a motor compressor protection module and a

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dual inline pin switch that is used with the protection module to shut the motor down when readings are excessive (col. 3, line 35 - col. 4, line 28). Shutting down the motor alters the control content. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection combination, as taught by Solomon and Braun, to include a protection module with a switch, as taught by Swanson, because then the compressor would have been protected from overload (col. 2, lines 6-13).

Solomon and Braun do not teach a protection component that makes failure diagnosis, as shown in claim 28, and a memory that stores the result of the diagnosis, as shown in claim 29, or forecasting a failure, as shown in claim 30, or a communication component, as shown in claim 31. Swanson teaches diagnosing and error and sending the message to a display of a microprocessor (col. 5, lines 37-48). Memory for storage of the diagnosis would be necessary to display the error. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection combination, as taught by Solomon and Braun, to include a protection module with display for error messages, as taught by Swanson, because then the compressor would have been protected from overload (col. 2, lines 6-13).

16. Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon in view of Lee and Gousset.

Solomon teaches all the limitations of claim 7 upon which claims 34 and 35 depend. Solomon does not teach a brushless DC motor, as shown in claims 34 and 35. Lee teaches a brushless DC motor (Abstract). It would have been obvious to one of

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ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include fault detection for a brushless DC motor, because then the motor would have been protected against adverse conditions (col. 1, lines 25-36).

Solomon does not teach deriving motor temperature based on the current and voltage and the motor instrument constants, as shown in claims 34 and 35. Gousset teaches using current to modeling the temperature of a motor using the output of current sensors placed on motor power supply phases (Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fault detection, as taught by Solomon, to include determining motor temperature, as taught by Gousset, because then the motor would have been protected from prolonged overload (col. 1, lines 10-18).

#### ***Allowable Subject Matter***

17. Claims 11, 12, 22 and 36-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and to overcome any minor informalities.

#### ***Conclusion***

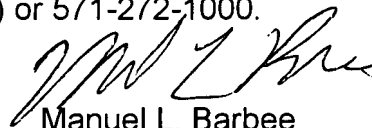
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manuel L. Barbee whose telephone number is 571-272-2212. The examiner can normally be reached on Monday-Friday from 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on 571-272-7925. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Manuel L. Barbee  
Examiner  
Art Unit 2857

mlb  
September 6, 2007